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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

ALANKO, ANITA KAREN

ART UNIT	PAPER NUMBER
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1765

DATE MAILED: 08/13/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/938,644

Applicant(s)

RUEGER, NEAL

Examiner

Anita K Alanko

Art Unit

1765

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 6/5/03 amdt "b".
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-66 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-66 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 2, 8, 9, 14-18, 23-24, 28-31, 33, 39-41, 44-49, 53-54, 57-61, 63-64 are rejected under 35 U.S.C. 102(b) as being anticipated by Moslehi (US 5,079,481).

Moslehi discloses a method comprising real-time adjustments of the magnetic field distribution and flux density during etching, which encompasses controlling etching of the substrate by adjusting the magnetic field intensity and magnetic field direction.

Moslehi also discloses anisotropic etching of insulating materials such as oxide and nitride (col.5, lines 54-58), which encompasses etching a substrate with a contour since the method is for forming a semiconductor device, which in turn inherently includes depressions and protrusions. The depression encompasses a hole, trench, protrusion or pillar since the structure is repeated several times across the surface of the wafer as hills and valleys.

Claims 1-11, 14-18, 21, 23-26, 28-38, 40-41, 44-51, 53-54 and 57-66 are rejected under 35 U.S.C. 102(b) as being anticipated by Kadomura (US 5,662,819).

Kadomura discloses a method comprising pulsing a helicon wave plasma and an inductively coupled plasma (col.10, lines 54-65) simultaneously and as a function of time with the RF bias power (col.12, lines 7-31, since the RF power is changed from 100 W to 150 W during the etch of the substrate, Fig. 8A-8C). The pulsing of the helicon wave plasma

encompasses controlling the etching by adjusting the magnetic field intensity and magnetic field direction because, since the helicon wave plasma is pulsed on and off, the magnetic field is pulsed on and off. Also, since the RF bias is varied during etching, the method of Kadomura encompasses controlling the etching by adjusting the RF bias power during etching.

Kadomura discloses to etch insulating materials with various gases including oxygen (col.12, lines 7-31). The contour etched by Kadomura is depicted in Figure 8, and encompasses either a depression, hole, trench, protrusion or pillar since the structure is repeated several times across the surface of the wafer as hills and valleys.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-66 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kadomura (US 5,662,819).

The discussion of Kadomura from above is repeated here.

As to claims 12-13, 42-43 and 55-56, Kadomura does not disclose to etch silicon oxide or silicon nitride. However, these are conventional semiconductor materials and they are conventional patterned by etching. It would have been obvious to one with ordinary skill in the art to use the method of Kadomura to pattern silicon oxide or silicon nitride because they are conventional materials that are patterned by etching in the semiconductor field.

As to claims 19, 20, and 22, Kadomura does not disclose the cited etch compositions. However, these are conventional plasma etchants. It would have been obvious to one with ordinary skill in the art to etch with the cited gases using the method of Kadomura because they are conventional etchants.

As to claims 27 and 52, Kadomura discloses a bias power of 150 watts, not 300 watts or greater. However, the power determines the effectiveness of the plasma etchant. It would have been obvious to one with ordinary skill in the art to etch with the cited power in the method of Kadomura because the power appears to reflect a result-effective variable which can be optimized. See MPEP 2144.05 IIB.

Claims 1, 2, 5, 8, 9, 12-31, 33 and 39-65 are rejected under 35 U.S.C. 103(a) as being unpatentable over Moslehi (US 5,079,481).

The discussion of Moslehi from above is repeated here.

As to claim 5, it would have been obvious to one with ordinary skill in the art to adjust the magnetic field direction and the magnetic field intensity simultaneously in the method of Moslehi in order to save time.

As to claims 12-13, 42-43 and 55-56, Moslehi discloses to etch oxide and nitride, but does explicitly cite silicon oxide and silicon nitride. It would have been obvious to one with ordinary skill in the art to etch silicon oxide and silicon nitride in the method of Moslehi because they are conventional semiconductor materials that are patterned by etching.

As to claims 19- 22 and 62, Moslehi does not disclose the cited etch compositions. However, these are conventional plasma etchants. It would have been obvious to one with

ordinary skill in the art to etch with the cited gases using the method of Moslehi because they are conventional etchants.

As to claims 25, 50 and 65, Moslehi discloses to use magnets (for example, magnetron 20, col.9, lines 53-56), not electric coils. It is well known in the art to use coils instead of magnets to produce a magnetic field. It would have been obvious to one with ordinary skill in the art to use coils in the method of Moslehi because they are a functionally equivalent method of forming a magnetic field.

As to claims 26-27, 51-52, Moslehi does not disclose the RF bias power. However, the power determines the effectiveness of the plasma etchant. It would have been obvious to one with ordinary skill in the art to etch with the cited power in the method of Moslehi because the power appears to reflect a result-effective variable which can be optimized. See MPEP 2144.05 IIB.

Response to Amendment

The 112, 102 and 103 rejections are withdrawn. The allowable subject matter of paper number 4 is withdrawn. The rejection over Johnson is withdrawn because RF power is not applied to substrate, as noted by the applicant.

The claims are now rejected over Moslehi or Kadomura. Moslehi discloses real time adjustment of the magnetic field, but not the combination of varying the RF bias power and magnetic field simultaneously. Examiner notes that the claims as broadly cited do not claim a method commensurate in scope with the method as shown in Figures 9-10. Processing of contours are inherently part of the prior art, for example, the nonuniformity or undercut which occurs (undesirably) during etching of a substrate through a mask.

Paper No. 9

Art Unit: 1765

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anita K Alanko whose telephone number is 703-305-7708. The examiner can normally be reached on Monday-Wednesday and Friday, 8:00 am-4:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 703-305-2667. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

Anita K. Alanko

Anita K Alanko
Primary Examiner
Art Unit 1765

AKA
August 11, 2003